

10/088441

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

REC'D 03 MAR 2003

WIPO

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Applicant's or agent's file reference N-6554		FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/US00/40921	International filing date (day/month/year) 18 SEPTEMBER 2000	Priority date (day/month/year) 17 SEPTEMBER 1999	
International Patent Classification (IPC) or national classification and IPC IPC(7): HO2N 3/00; HO1J 9/00 and US Cl.: 310/306; 136/205; 313/309, 336			
Applicant Vanderbilt University			

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 47 sheets.
☐ This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority. (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).
 These annexes consist of a total of — sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of report with regard to novelty, inventive step or industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☐ Certain observations on the international application

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Date of submission of the demand 27 MARCH 2001	Date of completion of this report 24 JANUARY 2003
Name and mailing address of the IPEA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231	Authorized officer KARL IMAYOSHI EIZO TAMAKI Deborah P. Vega Paralegal Specialist Technology Center 2800
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Form PCT/IPEA/409 (cover sheet) (July 1998)*

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INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/US00/40921

I. Basis of the report

1. With regard to the **elements** of the international application:*

☐ the international application as originally filed
☒ the description:
 pages 1-20 , as originally filed
 pages NONE , as amended (together with any statement) under Article 19
 pages NONE , filed with the letter of _____

☒ the claims:
 pages 21-26 , as originally filed
 pages NONE , as amended (together with any statement) under Article 19
 pages NONE , filed with the letter of _____

☒ the drawings:
 pages 1-13 , as originally filed
 pages NONE , as amended (together with any statement) under Article 19
 pages NONE , filed with the letter of _____

☒ the sequence listing part of the description:
 pages NONE , as originally filed
 pages NONE , as amended (together with any statement) under Article 19
 pages NONE , filed with the letter of _____

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.
 These elements were available or furnished to this Authority in the following language _____ which is:

☐ the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).
☐ the language of publication of the international application (under Rule 48.3(b)).
☐ the language of the translation furnished for the purposes of international preliminary examination (under Rules 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

☐ contained in the international application in printed form.
☐ filed together with the international application in computer readable form.
☐ furnished subsequently to this Authority in written form.
☐ furnished subsequently to this Authority in computer readable form.
☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. ☒ The amendments have resulted in the cancellation of:

☒ the description, pages none
☒ the claims, Nos. none
☒ the drawings, sheets/fig none

5. ☐ This report has been drawn as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).**

* Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17).

**Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/US00/40921

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**1. statement**

Novelty (N)	Claims <u>7 and 20</u>	YES
	Claims <u>1-6, 8-19, and 21-25</u>	NO
Inventive Step (IS)	Claims <u>none</u>	YES
	Claims <u>1-25</u>	NO
Industrial Applicability (IA)	Claims <u>1-25</u>	YES
	Claims <u>none</u>	NO

2. citations and explanations (Rule 70.7)

Claims 1-3, 6, and 8-11 lack novelty under PCT Article 33(2) as being anticipated by Geis et al. (US 5,713,775). Geis teaches the claimed energy conversion device and the method of converting energy including a diamond emitter.

Claims 1-6, 8-19, and 21-25 lack novelty under PCT Article 33(2) as being anticipated by von Windheim (US 5,679,895). Windheim teaches the claimed energy conversion device and the method of converting energy, including a diamond emitter.

Claims 7 and 20 lack an inventive step under PCT Article 33(3) as being obvious over von Windheim (US 5,679,895) in view of Kumar (US 5,614,353). Von Windheim teaches every aspect of the invention except a polycrystalline structure with sp² bonding. Kumar teaches a polycrystalline structure with sp² bonding. Since both von Windheim and Kumar are used in the field of thermionic emission, it would have been obvious to a person of ordinary skill in the art at the time of the invention to construct the emitter of von Windheim with the sp² bonds because Kumar teaches that sp² bonds are common atomic bonds for emitters.

Claims 1-25 meet the criteria set out in PCT Article 33(4) and thus have industrial applicability because the diamond emitter can be used in the thermionic conversion industry.